

III. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The following conclusions are based on all of the information and analyses that were considered as part of the process to create this plan, including the ground water modeling results and the projected growth in water demand in the LWC Planning Area.

- (1) Analyses based on the application of resource protection criteria indicate that development of water resources to meet projected urban and agricultural demands has the potential to cause significant harm to water resources and associated natural systems.
- (2) New sources of water will need to be developed to meet increasing demands for water. Existing sources of water will need to be used and managed more efficiently.
- (3) There is insufficient information to evaluate the full capacity of some new water sources. This information needs to be developed as quickly as possible.
- (4) Competition for water among water users within the LWC Planning Area is expected.
- (5) Competition for water between water users and the environment and among water users will require the District to make decisions concerning which uses of water best serve the public interest. The regulatory framework for making these decisions needs to be put in place as quickly as possible in order to promote maximum reasonable-beneficial use of water resources.

ALLOCATING WATER RESOURCES

The goal of the SFWMD's water supply planning effort, as stated in the Water Supply Policy Document, is to attain maximum reasonable-beneficial use of water. This plan is designed to achieve this overall goal in the LWC Planning Area through a combined, integrated analysis which supports protection and enhancement of the environment while meeting the needs of the region through such methods as diversifying supply sources. Implementation of this plan's comprehensive recommendations will combine to better protect the environment, lessen competition among users, decrease the frequency, severity and duration of water shortages, and otherwise promote prudent management of the state's natural resources. The following is a discussion of the major policies and objectives which arise in formulating recommendations on the subject of allocating water.

The overall allocation scheme is designed to maximize the level of certainty for legal water users, consistent with other agency objectives. To accomplish this task, the plan recommendation "package" will propose change to the current allocation method in four general areas: (1) developing new sources, (2) increasing efficiencies, (3) altering water resource protection strategies, (4) performing additional studies of water resources and the environment. Associated with the development of new allocation methods is the proposed strategy for water resource/environmental protection. Since these environmental protection provisions actually serve to define

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what water remains for allocation, the policy determinations for these matters are of primary importance. The following discussion presents an overall view of these policy decisions, in the context of resource allocation, in an attempt to explain the relationship between these factors.

The plan's recommended environmental protection objective is to protect the functions and values of the planning area's natural systems and their associated ecosystems. Water needs for these systems are defined as being dependent upon a number of factors including hydrology, soil type and wetland type. Resource protection criteria are then developed and directed toward defining levels of significance of impact in terms of severity, duration and frequency. A series of additional objectives and policies follow from this threshold determination to protect the function and values of natural systems. Specifically, the reservation from allocation of that supply required to maintain or enhance these protected natural systems must occur in coordination with the protection criteria. Establishment of the Outstanding Natural System and mitigation banking concepts work in conjunction to preserve the natural systems while allowing human uses to occur in harmony with the stated environmental objectives. Optimization of surface water management control elevations to achieve the primary purpose of protecting natural systems as well as flood protection and water conservation is another associated objective.

Recommendations concerning development of new supply sources raises policies which, although first conceived of in the Water Supply Policy Document, will be implemented for the first time as a result of the plan's initial determinations and subsequent agency actions in such areas as rulemaking and operations. New sources include such under-utilized supplies as the Floridan Aquifer System, reverse osmosis/desalinization and aquifer storage and recovery technology. A two step policy determination is necessary to effectuate this diversification. First, limits on existing supply sources must be established, then guidance on development of the new source must be provided. Included in this process as the first step is the associated concept of aquifer or supply source zoning. The designation, or "zoning," of water bodies where specific, priority use types are granted a preference in competition is a threshold policy concept recommended for further exploration and potential implementation by this plan as a means of requiring use of new sources. Another policy concept which the alternative recommendations address is requiring use of the lowest quality water appropriate for the intended purposes, specifically reuse of reclaimed water. Recommendations suggest staff explore criteria development to require reuse of reclaimed water to the maximum extent in the region through subsequent rulemaking efforts.

Another general area of recommendations concerning allocation schemes concerns efficiency and demand management. Two policy objectives that work in conjunction with each other in this are: prohibition of wasteful and unreasonable uses of the state's water supply while continuing to provide a "certain" or dependable supply for users. The task of the Governing Board is to provide staff with policy guidance on alternatives to balance these interests. The plan's recommendations attempt to achieve a balance between these sometimes divergent interests. Specifically, the plan recommends the Governing Board direct staff to further explore requiring increased efficiency measures for both urban and irrigation users through continuing to require water conservation plans for urban uses, exploring increased agricultural irrigation efficiency, improved drainage management and coordination with local governments, particularly in "water poor" regions. Implementation of these conservation measures must be accomplished through rulemaking proceedings. These efficiency measures will result in less water allocated to users, thereby

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stretching supplies and preserving the resources for future users while simultaneously achieving environmental protection objectives. With less water allocated to users, less protection from drought events occurs. Thus, the corresponding subject of a user's physical certainty, or the risk of drought, arises. The need for definition of supplemental crop irrigation requirements (volume) or return frequency of droughts thus is addressed in plan recommendations and must be evaluated in rulemaking.

The recommendations presented in this chapter provide initial direction towards meeting the overall goal, guiding directives, and policies outlined in Chapter I. Moreover, the recommendations are intended to be guidance to staff, but are not intended to impose any requirements upon the regulated community, local governments or the citizens of the planning region. By accepting this plan, including the following recommendations, the Governing Board is making a preliminary determination to pursue the courses of action set forth in the recommendations. Each recommendation is accompanied with a set of implementing steps involving further Governing Board decisions and participation in such areas as budget preparation, rulemaking and local government coordination. These recommendations are not intended to be inflexible. For example, while acceptance of this plan will result in staff exploring the concepts stated in the recommendations, further analysis, input from interested citizens and other factors may influence the staff and/or Governing Board to alter the course set forth in this planning document; thus the characterization of this document as "dynamic." In sum the recommendations do not constitute final agency action on any of the subjects discussed.

Organizationally, there are four general recommendation areas, stated above. Each recommendation area contains a number of subtopics related to the general category. The following discussion presents a summary of issues and conclusions associated with each subtopic and, then the specific recommendations. Finally, since the recommendations guide staff and do not provide final determinations on any of the subjects, a list of anticipated, future Governing Board actions related to each recommendation is provided. This list of future Governing Board decisions related to each recommendation may change as additional matters are brought to staff's attention through further analysis, input from interested citizens, rule development, local government coordination and the like. This plan does not contend that these recommendations alone will satisfy the plan goal and all of the directives and policies. However, these recommendations, if implemented, will begin the process of altering the current trends.

RECOMMENDATIONS

Develop New Sources of Water

Opportunities exist for developing new sources of water in the LWC Planning Area. The development of these new sources probably offers the greatest opportunity to balance the increasing demands of urban and agricultural water users with the need to protect the environment.

Deeper Aquifers

Hydrogeologic information suggests that additional water can be supplied to the LWC Planning Area from deeper aquifers such as the Floridan Aquifer System. Water from this aquifer system will require desalination and treatment for potable

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use. The SFWMD has embarked upon a major aquifer exploration program in the LWC Planning Area to evaluate the quality and productivity of the Floridan Aquifer System. The plan for the Floridan Aquifer testing program includes drilling and testing at four to six sites in the planning area during fiscal years 1993-94 through 1995-96. A final report is scheduled to be completed by October 1, 1996.

The Sandstone aquifer may be able to provide additional capacity in portions of Hendry County. The extent and thickness of the Sandstone aquifer in northeastern Hendry County needs to be mapped and evaluated.

Data contained in Chapter V of the Background Document and in "Water Supply Cost Estimates" (Post, Buckley, Schuh & Jernigan Inc., 1991) indicate that the capital and operating costs of the reverse osmosis (RO) systems which are required to utilize the brackish Floridan aquifers may be \$.10 to \$.24 per thousand gallons higher than the capital and operating costs of the lime or membrane softening processes used for the Surficial Aquifer System water. A higher cost differential would apply when treatment capacity has already been constructed. In that case, utilities required to switch to a brackish aquifer would save only the operating costs of the Surficial treatment process and would bear the capital and the operating cost of going to the deeper aquifer. The additional cost in this case may be \$.73 to \$.85 per thousand gallons. The programs of exploration, mapping and testing proposed below are expected to cost the District \$1.2 million over the next five years.

Recommendations:

- (1) The District should budget for and complete its planned drilling and testing of the Floridan Aquifer System in the LWC Planning Area by October 1, 1996.
- (2) The District should make preliminary results of the Floridan Aquifer testing available in a timely fashion to public and private water suppliers and local governments.
- (3) The District should conduct exploration, mapping, and testing of the Sandstone aquifer.
- (4) The District should develop criteria for development of the Floridan Aquifer System using RO technology.

Future Governing Board Considerations:

- Budgetary process for research and potential District project (e.g., District ASR project).
- Presentation of Final Reports on Floridan Aquifer tests.
- Potential Local Government Coordination.
- Potential comments on local government comprehensive planning elements.
- Rule development/adoption regarding criteria for Floridan Aquifer development.

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Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) is defined as the underground "storage" of injected water in an acceptable aquifer during times when water is available, and the subsequent "recovery" of this water when it is needed. Simply stated, the aquifer acts as a reservoir for the injected water. There are five ASR facilities in operation in Florida: (Manatee County, Peace River, Cocoa, Port Malabar, and Boynton Beach. In addition, there are another 23 systems in Florida in some stage of investigation, of which the following are in the development or testing phases: Lake Okeechobee/Taylor Creek, Marathon, Stock Island, Tampa, and Collier, Lee, Dade, and Broward counties.

Operating ASR facilities in the U.S. generally store treated drinking water, though there is interest in using raw water or reclaimed water for ASR. Potential sources of water for ASR application in Florida include surplus surface water (treated or untreated), ground water, potable water, and reclaimed water (CH2M Hill, 1993). Potential uses of ASR in South Florida include enhancing potable and agricultural water supplies, improving water quality, preventing saltwater intrusion, increasing water storage capability, controlling contaminant plumes, and maintaining distribution system flows or pressure.

ASR projects may be able to provide a number of benefits for the LWC Planning Area, including: (1) decreasing the intensity of ground water pumping from the shallow aquifer system during the peak-use dry season and potentially mitigate drawdown impacts on wetlands, (2) allowing utilities to reduce treatment capacity and associated costs by using excess off-peak capacity to treat ASR water and then using the ASR water to meet peak demands, and (3) providing "new" water if increased recharge of the shallow aquifer system is induced by the operation of such a system.

Cooperative agreements with public and private water suppliers and local government appear to be a good way to evaluate the feasibility of ASR. There are two ongoing examples of local government cooperative agreements to test the feasibility of ASR in the LWC Planning Area. Collier County is currently working with the Big Cypress Basin Board to cooperatively fund an ASR project. In addition, the District has provided funding to the Lee County Regional Water Supply Authority for an ASR feasibility study in Lee County.

While there are several potential benefits to ASR projects, there are still some risks associated with uncertainty about the technical and institutional feasibility of ASR. For example, permitting of untreated surface water ASR is still a difficult and uncertain process. In view of the potential risks and benefits of ASR for the LWC Planning Area, this plan makes a number of recommendations to reduce the uncertainty involved in planning ASR projects.

Data in Chapter V of the Background Document indicate that the additional capital and operating costs per thousand gallons recovered for the ASR system operation would be \$.23 to \$.27 per thousand gallons when the water recovered in a year is 100 times the daily recovery capacity. These costs may not fully account for the surface facilities (piping, storage, chlorination, etc.) that utilities might incur. Other available data indicate that "typical unit costs for water utility ASR systems now in operation tend to range from \$200,000 to \$600,000 per MGD of recovery capacity" (CH2M Hill, 1993, p. 6-15). At the same annual recovery rate used above (100 times the daily recovery capacity) the costs per thousand gallons recovered

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would be \$.30 to \$.70 per thousand gallons. Treatment system cost savings could more than offset the injection and recovery costs but are situation specific. The programs proposed below to further evaluate this option are expected to cost the District \$3 million over the next five years.

Recommendations:

- (5) The District should continue to work with public and private water suppliers and local governments in identifying additional sites for ASR projects. The District should continue to provide funding to support additional ASR facilities in the planning area.
- (6) The District should actively work with the Florida Department of Environmental Protection (FDEP) regarding Florida Underground Injection Control (UIC) regulations to address the concepts of ASR in Florida laws.
- (7) The District should determine areas within the region where canal flow into estuaries can be reduced and stored underground for eventual use.
- (8) The District should prepare criteria for implementing ASR within the Floridan Aquifer System.

Future Governing Board Considerations:

- Local government cooperative agreement execution.
- Budgetary process for research funding and support for ASR facilities, either District operated or cooperatively developed, within the planning area.
- Rule development/adoption regarding criteria for ASR development of the Floridan Aquifer.
- Potential rule development/adoption concerning artificial injection/ recharge.
- Potential interagency agreements with the Department of Environmental Protection concerning matters such as the permitting and operation of ASR projects.

Reclaimed Water

Reclaimed water is a significant potential source of water for the LWC Planning Area. Discharges from wastewater treatment plants in the planning area are anticipated to rise from 43 MGD in 1990 to approximately 147 MGD in 2010. Potential uses of reclaimed water include landscape and agricultural irrigation, ground water recharge, industrial uses, environmental enhancement, and fire protection. Approximately 45 percent of the total wastewater discharge in 1990 was directed to reuse.

Although reclaimed water is a significant source of water for the LWC Planning Area, the model simulations showed a relatively small improvement in meeting resource protection criteria for wetlands and aquifer protection when the reclaimed water supply was fully utilized. Modeling results suggest that reclaimed water could probably be more effective in preventing seawater intrusion; however, the scale of the ground water models used for this plan could not provide detailed information about

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the use of reclaimed water for mitigation of seawater intrusion. Nevertheless, increased use of reclaimed water appeared to be very effective in reducing seawater intrusion according to the modeling simulations.

Requiring 100 percent reuse as specified in the recommendation below would impact only those wastewater systems which would not be achieving this goal without the implementation of this plan. A review of the wastewater utility capsules presented in Appendix E and related data indicates that, with a few exceptions, the existing disposal plans of wastewater utilities in the LWC Planning Area include reuse sufficient to achieve the 100 percent reuse goal. Region-wide the use may fall short of the goal by approximately 25 MGD of the estimated target of 122 MGD. Adoption of a new rule for reclaimed water would help assure that the present plans are implemented.

The additional disposal costs to assure reuse of the 25 MGD apparently not included in present plans will depend on which options may be available to particular wastewater utilities. Options which may be expanded to accommodate the use of the remaining targeted wastewater may include transmission to other areas where there is a deficit of reclaimed water, the use of percolation ponds, especially in locations where well fields may benefit from the ground water recharge, and additional residential reuse. If a regional wastewater distribution system is needed, the lead could be taken by a regional water supply authority for the county. Based on a review of planning level cost studies (including Lee County Regional Water Supply Authority, 1993 and Boyle Engineering, 1992), the costs of implementing such systems may vary from around \$1.15 to \$1.60 per thousand gallons which would make the cost of the additional reuse on an annual basis about \$10.5 to \$14.5 million.

Recommendation:

- (9) The District should initiate the rule development process for new water use rules that accelerate the use of reclaimed water in the LWC Planning Area.

Future Governing Board Considerations:

- Rule development/adoption concerning reuse criteria as detailed in the recommendation.

Surface Water Resources

Surface water bodies in the LWC Planning Area include lakes, rivers, and canals which provide storage and conveyance of surface water. Lake Trafford and Lake Hicpochee are the two largest lakes within the planning area, but neither lake is considered a good source of water supply.

The Caloosahatchee River is the most important source of surface water in the region. The river is supplied by inflows from Lake Okeechobee and runoff from within its own basin. The freshwater portion of the river (C-43) extends eastward from the Franklin Lock and Dam (S-79) towards Lake Okeechobee and the cities of La Belle and Moore Haven. West of S-79, the river mixes freely with estuarine water as it empties into the Gulf of Mexico. The Caloosahatchee River may be able to yield additional water to augment water supplies during the wet season by reducing wet season discharge to the ocean. The feasibility of developing a seasonal water supply from the Caloosahatchee River depends upon the nature and extent of potential

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environmental impacts as well as the availability of a suitable storage facility. Aquifer storage and recovery technology appears to be the most likely storage option.

The remaining rivers and canals in the LWC Planning Area drain either into the Caloosahatchee River or the Gulf of Mexico. The majority of canals were constructed as surface water drainage systems rather than for water supply purposes. The C-43 Canal is the only major canal used for water supply and it is maintained by releases from Lake Okeechobee on a schedule operated by the U.S. Army Corps of Engineers.

The Lee County Department of Natural Resources completed work on the Lee County Surface Water Management Master Plan, but it has not yet been adopted by the Board of County Commissioners. This plan includes recommendations to help increase water supply of the 49 basins within Lee County. Lee County has created the Lee County Storm Water Utility to implement the recommendations in the master plan. There has also been a proposal to the county for retrofitting structures within the Lehigh Acres area to increase the water levels within this area during the dry season.

As of 1992 the costs of capital improvement for 30 of the Lee County basins had been estimated and totaled \$67.5 million (Johnson Engineering, 1990-92; Johnson Engineering *et al.*, 1990-91). The programs proposed below to cooperatively further evaluate the feasibility of using the Caloosahatchee River as a seasonal source of supply are expected to cost the District \$300,000 over the next five years.

Recommendations:

- (10) The District should enter into a cooperative agreement with the Lee County Regional Water Supply Authority to explore the feasibility of using the Caloosahatchee River as a source of supply, perhaps in conjunction with ASR technology.
- (11) The District should coordinate with the Lee County Department of Natural Resources to assist adoption of the current Lee County Surface Water Management Master Plan by the Lee County Board of Commissioners. The District should also continue to cooperate with Lee County in identifying other potentially beneficial improvements and water management strategies for Lee County in the future.
- (12) Lee County should adopt a dedicated funding source for the Lee County Storm Water Utility.

Future Governing Board Considerations:

- Execution of cooperative agreements.

Use Water More Efficiently

Urban and Agricultural Water Conservation

There are opportunities to use water more efficiently, primarily by increased urban and agricultural conservation. Increases in water use efficiency due to conservation will not be sufficient to supply the increased demands for future growth, nor will they be sufficient to provide the level of environmental protection that is

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advocated under this plan. Although conservation will only be one part of the solution to future water supply, its portion is important.

Results from alternative modeling scenario 2 as described in Chapter II of this document indicate that increasing agriculture irrigation efficiency would have a positive effect on wetland protection. When the irrigation efficiency of small vegetables alone was improved (scenario 2a) there was a 7 percent reduction in area of wetlands that had not met the wetland protection criterion compared to the 2010 base case. When the irrigation efficiency of citrus alone (scenario 2b) was increased there was only a 1 percent reduction in wetland problem areas. When irrigation efficiency for citrus and vegetables was increased (scenario 2c) the models indicated that an 8 percent reduction in wetland problem areas compared to the 2010 base case. While this reduction is not dramatic it does indicate that additional benefit can be realized by increasing the existing irrigation efficiency of agriculture, particularly vegetables.

Recommendations:

- (13) The District should continue to require water conservation plans for public and private water suppliers, commercial and industrial water use, and irrigation of landscape and golf courses. These plans should at least contain the current (January 1993) mandatory water conservation elements.
- (14) The District should explore the rule development process for new water use rules that promote increasing irrigation efficiency for vegetable fields in the Lower West Coast region.

Future Governing Board Considerations:

- Governing Board consideration of cooperative agreements
- District budgetary process for research programs including aquifer monitoring and the relationship between water use, vegetable production rates and economic impacts.
- Rule development/adoption for increased irrigation efficiencies.

Inefficient Water Use Practices

In several areas of the LWC Planning Area (particularly in the "Four Corners" area where Hendry, Lee, Glades, and Charlotte counties meet) there are a number of domestic wells which, due to their design, are occasionally impaired by large agricultural withdrawals which cause regional water level declines. Until these inefficient small domestic facilities are enhanced, it is not possible to maximize reasonable-beneficial use in the area. Historically, the District has required the large users in the area to mitigate these impacts by installing efficient withdrawal facilities for the domestic users in the impaired area. The District has also worked with local governments to require changes in well construction rules. Until all users have maximized their efficiency, development of water resources in these areas will effectively be "held hostage." This situation is in conflict with State water policy.

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Recommendation:

- (15) The District should explore rulemaking and funding options to address mitigation of impacts by large urban and agricultural users caused by regional water level declines on inefficient domestic withdrawal facilities.

Future Governing Board Considerations:

- Rule development/adoption concerning mitigation criteria for inefficient facilities addressing such issues as funding for domestic well replacement, minimum levels for aquifer development for all use types, linkage to water shortage restrictions, timing of well replacement and minimum facility type.
- Potential District budgetary process.
- Potential Local Government cooperative agreements.

A map of suggested depths for domestic wells tapping the Sandstone aquifer in the region is found in Appendix L.

Drainage Management

Changing drainage management practices may be an efficient way to mitigate impacts to wetlands. The modeling analysis indicates that modifying water levels in existing drainage canals and eliminating unnecessary canals can significantly elevate ground water levels beneath wetlands. Lee and Collier counties have undertaken extensive studies of their surface water systems, resulting in recommendations to alter the current management practices and structures.

The information used to simulate these water levels for Collier County was derived from one of the drainage management projects proposed by the Big Cypress Basin for the area around Golden Gates Estates South in west central Collier County. Additional specific drainage management projects for the Big Cypress Basin are outlined in their five-year capital improvements plan for fiscal years 1994 through 1998.

A conceptual need has been identified to place water control structures on the Lee and Collier county portions of the Corkscrew canal system. The purpose of these structures is to prevent excessive drainage of the Bird Rookery Swamp portion of the CREW project.

The most recent five year capital improvement plan for the Big Cypress Basin includes about \$5.3 million to implement improved drainage management in the Basin. The program proposed below to further evaluate water control structures in the Corkscrew canal system is expected to cost the District \$800,000 over the next five years.

Recommendation:

- (16) The District should explore the drainage management plans proposed by the Big Cypress Basin for the Golden Gate Estates South area in west central Collier County and conduct preliminary studies and conceptual design for water control structures in the Corkscrew canal system.

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Future Governing Board Considerations:

- District budgetary processes.
- District studies concerning design of water control structures.

Coordination with Public and Private Water Suppliers and Local Governments

The District can help accomplish water resource management objectives with a program of cooperative agreements and cost-sharing projects with public and private water suppliers and local governments.

The Lee County Regional Water Supply Authority (RWSA) was created in 1990 and charged with identifying future urban water demands and sources. The RWSA includes representatives of Lee County, Fort Myers, Sanibel and Cape Coral utility departments. The RWSA contracted with a consultant to produce a long-range water supply plan for urban water users and utilities. The plan is near completion and will include recommendations for future supply sources, interconnects, and delivery systems through the year 2030.

Lee County's long-range water supply plan is expected to provide an approach to regional urban water supply planning that is more integrated than could be accomplished by the individual plans of the separate water suppliers in the county. Greater efficiency and utilization of both existing and planned facilities is possible with regional planning. The RWSA may enable public and private water suppliers and local governments and water suppliers to attain greater economies of scale by pooling their resources for the exploration of new water sources or the enhancement of existing infrastructure. For example, the RWSA is analyzing the efficacy of potable water system interconnects. Interconnection of water delivery systems does not augment existing supplies, but it may enhance flexibility for utility operators. Some of the recommendations anticipated to be included in the RWSA plan would be difficult to implement without the existence of the RWSA. The potential benefits of integrated urban water supply planning are significant enough that Collier County may want to consider exploring the creation of a regional water supply authority as well.

The "Draft Water Supply Master Plan 1993 - 2030" (Lee County Regional Water Supply Authority, 1993, Vol. 1, Table 4.4-1) projects revenue needs for fiscal years 1994 to 1998 to total \$61.2 million. This will cover administration, planning/testing, engineering/permitting, legal/land acquisition, construction and debt service. As is indicated below, specific projects in which the District may choose to financially participate have not been identified. Based on the cost of about \$750,000 which the District has expended in support of the Lee County Regional Water Supply Authority, a similar amount could be required to encourage the consideration of a similar regional authority in Collier County over the next five years.

Recommendations:

- (17) The District should identify specific projects and develop cost-sharing partnerships with public and private utilities and local governments to implement this plan during fiscal years 1994-95 through 1997-98.

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- (18) The District should encourage urban water suppliers in Collier County to explore the possibility of forming a regional water supply authority.

Future Governing Board Considerations:

- District budgetary processes, particularly for the purpose of cooperatively funding specific RWSA and local government projects.

Modify Planning and Regulatory Strategies to Protect Water Resources and the Environment

Outstanding Natural Systems

Environmental protection and enhancement are key elements of the District's mission and one of the most significant issues of the LWC Water Supply Plan. A special working group of the Advisory Committee designated certain lands within the LWC Planning Area as Outstanding Natural Systems (ONS). A map of the ONS lands in the LWC Planning Area is shown in Figure 21.

ONS lands include both publicly and privately owned lands. Most of the lands within the ONS areas are relatively pristine and undeveloped. Environmentally sensitive land management practices have been in place for many of the privately owned ONS lands. The ONS lands as a whole appear to offer the greatest opportunity for preserving ecological integrity and biological diversity because they contain a wide variety of plant and animal species and communities. Environmental scientists generally recognize that these communities do not exist in isolated habitats, but rather they operate as components of the larger natural ecosystem. Efforts to protect the ecosystem as a whole also serve to protect the individual species inhabiting the ecosystem. Such efforts might be characterized as an ecosystems approach to environmental protection. Development of the ONS lands concept is one of the most significant results of this plan.

Three strategies have been identified to implement the ONS lands concept. The ONS map will serve as a planning tool in guiding compatible land uses in and adjacent to ONS Lands. The ONS lands will also be used to target research on the relationship between ground water withdrawals and wetland impacts. Finally, the ONS map will be used to identify regional off-site mitigation areas. These implementation strategies form the basis of the recommendations related to ONS.

Recommendations:

- (19) The District should encourage the incorporation of the ONS lands concept into state, regional, and local planning efforts recognizing the distinctions between ONSe and ONSm as described in this plan.
- (20) The ONS map should be used to target the District's research program on the impacts of consumptive uses on wetlands.
- (21) The ONS map should be used to identify regional off-site mitigation areas.

Future Governing Board Considerations:

- Comments on Local Government Comprehensive Plans in addition to other state plans.

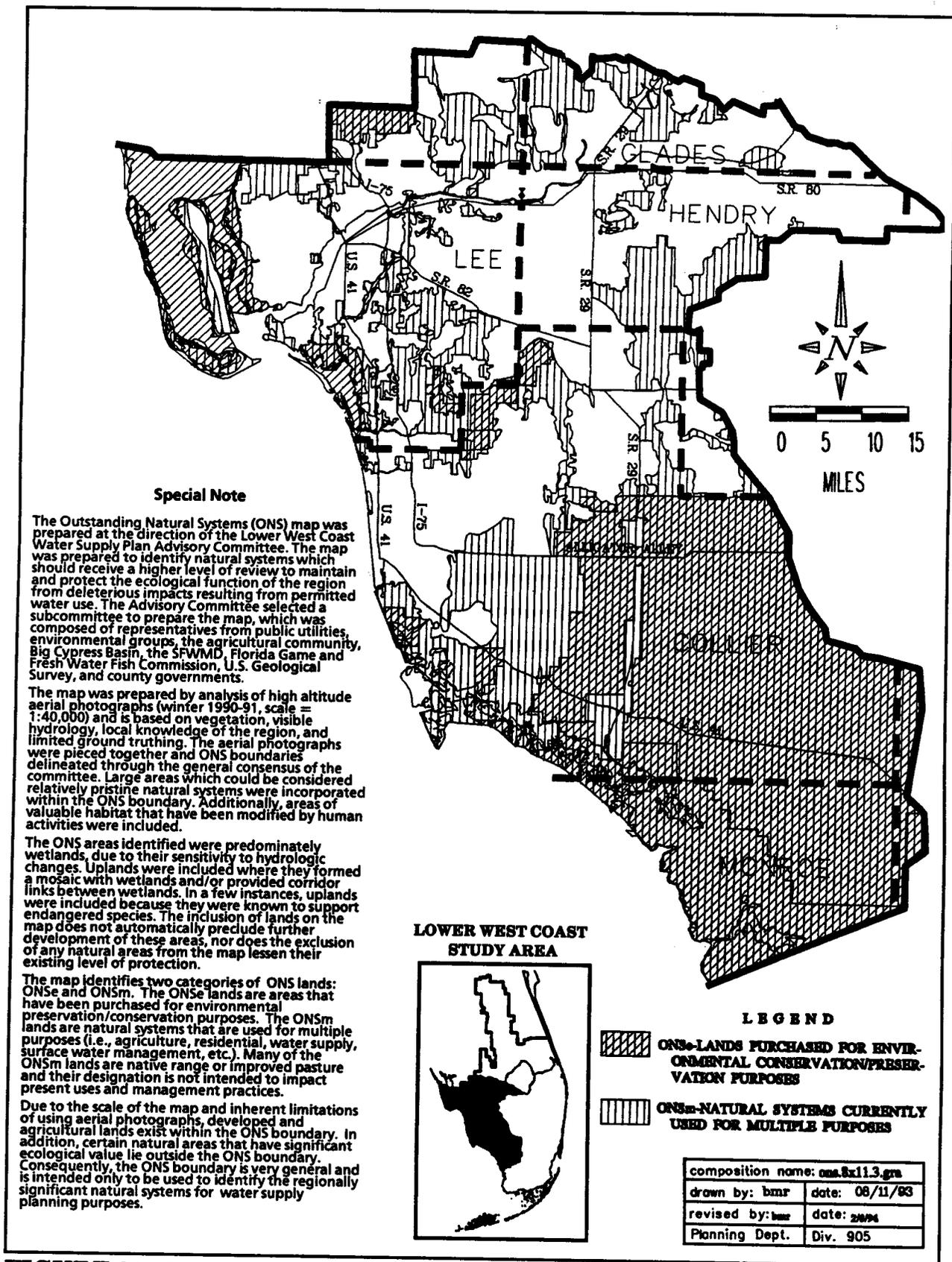


FIGURE 21. Outstanding Natural Systems in the LWC Planning Area.

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- District budgetary processes, particularly for funding research in stated areas.
- Rule development/adoption concerning mitigation banking areas and their usage in water use contexts.

Water Source Reservation

Ground water modeling results suggest that there is a potential for increased competition for water resources in the future. Most of the future competition for water in the LWC Planning Area will be for water in the shallow aquifers, because this water is the least costly to develop and generally has the highest quality. There will be less competition for new and alternative sources of water such as the Floridan Aquifer and reclaimed water.

The development of new and alternative sources of water will help to lessen future competition; however, not all water users will be able to use these sources, because of higher water costs or lower water quality. Other water users will be able to use the new and alternative sources, but will not use them while conventional sources remain available. The sharply increased potential for water use competition in the future suggests that it would be prudent for the District to explore modification of its rules for water use permitting to achieve the following objectives:

- (1) Maximize reasonable-beneficial use of water resources.
- (2) Lessen the amount of competition among water users.
- (3) Provide water users with additional information to plan for resolution of potential problems caused by competition with other water users.
- (4) Promote use of the lowest quality water available and suitable for an intended use.
- (5) Resolution of competition situations.

The District currently has limited rules which guide decision-making for water use permits when there is competition among applicants. However, competing application situations are currently resolved on a case-by-case basis. The District could achieve the objectives set forth above and promote quicker, more orderly, and more efficient development of new and alternative water sources by modifying its water use permitting rules to provide for water source reservation. Water source reservation, or "zoning," is the preferential reservation of water from one or more sources for use by one or more classes of water users when there is competition for water from that source or sources.

The concept of supply source reservation is extremely complex from multiple standpoints. Technical, legal, economic, social, and policy questions surround the District's determination in this regard. As stated in the introduction, this document is not self-executing. The District intends to initiate rulemaking proceedings to adopt criteria for implementation of many of the recommended actions, including supply source reservation. It is impossible at this early juncture to forecast the outcome of this rulemaking effort. Thus, while the plan recommends, as a starting point, specific source reservation actions, a host of related considerations must be addressed in the rulemaking effort. The purpose of this plan is to provide general guidance to initiate the source reservation and rulemaking efforts rather than to specifically direct the outcome.

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Statutory authority exists for reserving sources to protect the environment as well as to maximize reasonable-beneficial use or to resolve competition among human users. The State Water Use Plan (Section 373.036), the Reasonable-Beneficial test and Public Interest tests (sections 373.223 and 373.233) and the "Model Water Code" all provide insight into this concept.

It is important to note that it is the intent of the District to protect the public interest, particularly the existing infrastructure associated with public water supply sources. The source reservation concept is expected to be applied when future increases in demand trigger a competition between user classes. User classes are defined here as urban, agricultural, and environmental. Competition can also occur within a user class, such as potable water demands competing with landscape irrigation demands.

Prior to making a determination that competition between users will occur and that preference shall be granted to a user or class of users, several resource management steps must be exhausted. First, the efficiency of users should be maximized, unless overridden by other considerations. Secondly, the feasibility of using other sources must be explored, especially sources with the lowest quality of water available for the intended purpose. Examples of different sources include deeper aquifers, ASR technology, management of water levels through public works, interconnects, and the application of reclaimed water. If new sources are developed and the potential for competition still exists, especially between the environment and human uses, then opportunities for mitigation must be explored. If all of these actions fail to ameliorate the competition, resulting in potential harm to the resource or an existing legal user, then the allocation must be reduced or denied.

The source reservation concept is intended to be a mechanism to help avoid the reduction or denial of water allocations by providing prior notice to all users that certain users will have preferred access to certain sources within defined areas. This information would help other users to more successfully plan and implement long term water resource development strategies.

The current vision of the source reservation concept does not preclude non-preferred users from access to the reserved water source in question. However, it is expected that if a user does not have preference for that source, that user will encounter increased risk. This risk could occur in the form of shorter term permits, earlier cutbacks during water shortages, additional permit conditions and increased potential for denial of requests for expanding the allocation.

As part of the rulemaking process, District staff will develop an analysis of where competition is likely to occur in the future using hydrologic modeling and land use information. Once competition areas are identified, staff will analyze and propose, through rulemaking, resource related criteria to determine which use class is entitled to preference in each geographic area of expected competition. In this manner, uses which best serve the public interest may be identified. Possible criteria to be applied in this analysis include:

- applying resource protection criteria to identify potential problem areas,
- determining possible recharge benefits of use,
- enhancement of water resources in the area because of the nature of the activity or the amount of water required,

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- benefits to fish and wildlife,
- protection of public investment,
- whether water is exported from the area,
- reasonableness of the purpose of the use in relation to other uses,
- economic values of use,
- social values of use (public interest test),
- extent and avoidance of harm, and
- local government planning decisions.

Upon application of the selected criteria, staff will develop maps, supporting documentation and rule proposals which identify the preferred user classes for different sources and in different locations throughout the region. Throughout this public rulemaking process, the Governing Board will have a significant level of involvement in setting policy in this area.

One type of source reservation the District may consider is reserving Surficial Aquifer water for agricultural users in preference to utilities. In such a case, the cost differentials of \$.10 to \$.24 per thousand gallons presented in the discussion of the costs of going to deeper aquifers would be a relevant cost comparison when utilities needing new capacity were zoned out of the surficial aquifer.

Recommendations

- (22) The District should modify its rules for water use permits to provide for source reservation of the shallow aquifers for specific classes of water users in geographically specific areas where future competition among users occurs and when alternative management techniques are not appropriate.
- (23) The District should begin more detailed evaluations to determine how, where, and when water source reservation can be implemented.

Future Governing Board Considerations:

- Rule development/adoption.
- Comments on Local Government Comprehensive Plans in addition to other state plans.

Mitigation Banking

The District's responsibilities for environmental protection must be continuously balanced against the agency's other responsibilities. This balancing is reflected in the District's Water Supply Policy Document which sets forth the goal of attaining maximum reasonable-beneficial use of water while simultaneously achieving environmental protection.

Inherent to the ONS concept is the recognition that not all wetlands or other natural systems have equal potential for preserving ecological integrity and biological diversity. Smaller tracts of undeveloped land, particularly those surrounded by developed lands, may have less value for long-term ecosystem preservation than larger tracts. It may not always be feasible to protect smaller

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tracts of undeveloped land nestled among developed areas. Some smaller tracts may be altered under specific circumstances if other suitable lands off-site are restored and/or set aside for environmental mitigation. A regulatory program which provides for off-site environmental mitigation will accelerate the protection and enhancement of lands which have a greater value for ecosystem protection. The implementation of such a regulatory program would require: (1) a pool of lands suitable and available for off-site mitigation, and (2) specific criteria and rules governing off-site mitigation. A regulatory program incorporating these features is defined as an environmental mitigation banking program.

The District is currently working on guidelines and criteria to allow off-site mitigation of environmental impacts related to surface water management permits. However, there are currently no guidelines and criteria for allowing off-site mitigation of environmental impacts related to consumptive use permits.

Allowing mitigation of wetland impacts related to consumptive use permits could provide applicants with an economically attractive alternative when avoidance or on-site mitigation are not feasible. Mitigation costs are highly site specific and depend on the forms and amounts of mitigation required in each situation. Implementation of this recommendation will require rulemaking. A detailed economic analysis will be required in conjunction with the rulemaking.

Recommendations:

- (24) The District should develop specific criteria and rules to allow withdrawals of water to cause adverse environmental impacts if suitable off-site mitigation is provided.
- (25) Off-site mitigation should generally be allowed only when avoidance and minimization of adverse impacts is not feasible.

Future Governing Board Considerations:

- Rule development/adoption.
- Comments on Local Government Comprehensive Plans in addition to other state plans.
- District budgetary process to consider research, land acquisition and bank establishment.

Revisions to the District's Basis of Review for Water Use Permits

The District's current requirements for issuing water use permits are outlined in the Management of Water Use Permitting Information Manual, Volume III, which is also referred to as the "Basis of Review" (SFWMD, 1993). Current District requirements and guidelines provide different classes of water users with different levels of service for water use. Levels of service specify the amount of water allocated to a permittee, and, therefore, the frequency with which a permittee may expect to incur water shortages. Levels of service are usually, but not always, based on the calculated water needs of the permittee during a drought having some specified return frequency.

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The environment is also a user of water. Wetlands "use" of water is currently protected by limiting the drawdowns caused by water use permittees during a drought in which there is no rainfall for 90 days. Thus, wetlands theoretically have a different level of service than water use permittees.

The modeling analyses for this plan were based on the assumption that all classes of water users, including wetlands, were assigned a uniform level of service based on a drought with a return frequency of one in ten years. This is reflected in the wetland protection criteria which includes limits on the severity and duration of ground water drawdowns based on a drought with a return frequency of one in ten years.

Each of the resource protection criteria used in this plan incorporates three components that characterize and limit the severity, duration, and frequency of ground water level declines. The resource protection criteria used in this plan provide a rational and consistent methodology for both water use allocations and water shortage planning. They also provide a sounder basis for protecting wetlands by explicitly limiting the three components of water level declines that potentially have adverse impacts on wetlands.

Insofar as the adoption of the resource protection criteria requires the complete elimination of violations of the criteria, there may be far-reaching economic impacts. This is indicated by the modeling results in Chapter II, which show the most successful combination of alternative modeling scenarios still was not able to eliminate all wetland problem areas. It appears that large scale changes in the sources and/or amount of use must take place in at least some areas before criteria violations would be eliminated. Implementation of this recommendation will require rulemaking. A detailed economic analysis will be required in conjunction with the rulemaking.

Recommendations:

- (26) The resource protection criteria used in this plan (wetland protection, seawater intrusion protection, and general aquifer protection criteria) should be translated into rule form so that the criteria can be incorporated in the District's Basis of Review for water use permits.
- (27) The District should incorporate a uniform level of service for all water use classes into its Basis of Review for water use permits.

Future Governing Board Considerations:

- Rule development/adoption.

Perform Additional Studies of Water Resources and the Environment

Impacts to Natural Systems

Much remains to be learned about the relationship between consumptive use withdrawals of water and impacts to natural systems. Both new and ongoing studies need to focus on this relationship. The recently initiated Everglades Research Plan represents a significant opportunity for understanding the effects of alterations in hydrology on natural systems. It involves field and laboratory experiments to determine the biogeochemical and hydrologic parameters that cause large-scale

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ecologic change in the Everglades. It is anticipated that this effort will generate results that are relevant to the LWC Planning Area.

A major challenge is to sort out the effects of alterations in hydrology from the effects of other factors. Fire frequency and soil conditions are factors that have a major influence on the way vegetation is affected by consumptive use. Surface water drainage and changes in adjacent land uses must also be considered. This situation is further complicated by the fact that different types of wetland communities may be affected differently by changes in hydrology. All of these factors must be weighed to develop sound regulatory criteria that are tailored to specific wetland community types.

A major portion of the responsibility for the two programs proposed below, to (1) develop geographically specific regulatory criteria for drawdowns under wetlands and (2) to investigate the impacts that may have already occurred, will fall on the Research Appraisal Division. This division recently received six more positions to deal with these issues district-wide. A monitoring program similar to that proposed in the third recommendation below was recently instituted by the Southwest Florida Water Management District (SWFWMD). The SWFWMD expects their program to have a first year cost of about \$450,000 and annual costs of about \$90,000. This is considered to be a reasonable estimate of the commitment that the third recommendation below would require to implement the plan recommendation.

Recommendations:

- (28) The District should initiate a comprehensive research and monitoring program designed to better understand the relationship between consumptive use withdrawals and impacts to natural systems. The ultimate goal of this program should be to develop geographically specific regulatory criteria for drawdowns under wetlands that are tailored to specific types of wetland communities.
- (29) This research and monitoring program should include an investigation of whether impacts have already occurred as a result of consumptive uses in the LWC Planning Area. A review should be conducted to identify past permitted uses that seem to have had significant potential for wetland impacts. Remote sensing data, historical wetland survey information, and field data should be analyzed in an effort to evaluate whether impacts have actually occurred. Any impacts that are documented should be evaluated with respect to the amount of drawdown and the type of vegetative community.
- (30) The program should include long-term vegetative and hydrologic monitoring in areas where there is potential for future impacts to natural systems. The District already requires monitoring as a condition of certain consumptive use permits. It may be necessary to augment permit compliance data with additional monitoring data collected by the District. All monitoring data should be periodically compiled and evaluated for impacts caused by withdrawals.

Future Governing Board Considerations:

- District budgetary processes.

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- Governing Board consideration of research studies.
- Rule development/adoption.

Economic Analyses

Generic cost information for a variety of water supply options is included in the Background Document of this plan; however, detailed economic analysis of water supply options for specific areas was not conducted because of the regional nature of this plan. Additional economic analyses of water supply options which conform to the recommendations of this plan would be useful to water purveyors and users and to the District in rulemaking and preparing for the next update of the plan. The program proposed below to prepare economic cost-benefit analyses of specific water supply options would cost the District an estimated \$350,000.

Recommendation:

- (31) Detailed economic analyses should be performed for specific water supply options that appear to be particularly effective. Cost-benefit relationships should be prepared to evaluate regional options such as reuse, exploitation of deeper aquifer systems, and major surface water management projects.

Future Governing Board Considerations:

- District budgetary processes.
- Rulemaking.
- Future Water Supply Planning Documents.

Water Shortage Triggers

More efficient management of the water resources in the LWC Planning Area can be attained if water shortage management strategies were directly tied to the permitting and allocation process. The concept of "water shortage triggers" involves monitoring local and regional water levels and identifying key water levels that would initiate, or "trigger," management actions by the SFWMD and local landowners.

The target water levels could be identified for the Lower West Coast aquifer systems using the general aquifer protection criterion levels as a guide. The District could monitor water level trends in the region using water-level measurement and telemetry systems. The local landowners could monitor water levels in their wells. As water levels fall during an extended dry period, management actions, such as pumping cutbacks, could be initiated to protect the resource. Table 1 illustrates a hypothetical example of this concept. The local landowners could be familiar with these "trigger" water levels and would be able to operate their water management systems with greater flexibility. Land owners would have advance notice of actions that would be taken in the event of a water shortage because the target water levels and proposed water shortage management actions would be included as part of their water use permits.

The SFWMD is currently working on a proposal to develop these water shortage triggers for several planning areas in the District. Unfortunately, staff has not been

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able to complete this effort in time to be included in the draft of the LWC Water Supply Plan.

TABLE 1. Hypothetical Water Shortage Triggers.

Water Level (NGVD)	Water Shortage Phase	Management Action (Pumpage Reductions)
20 feet	Warning	Voluntary 15%
10 feet	Phase I	15% mandatory
Sea level	Phase 2	30% mandatory
Minus 15 feet	Phase 3	45% mandatory
Minus 25 feet	Phase 4	60% mandatory

Recommendation:

- (32) Staff should continue to develop the water shortage management scheme, and when it is complete the SFWMD should enter into rulemaking to implement this protocol in the LWC Planning Area.

Future Governing Board Considerations:

- Rule Development/Adoption.
- District Budgetary Processes.
- Water Shortage Declarations.

IMPLEMENTATION STRATEGIES

The recommendations stated above are intended to be guidance to staff. They are not intended to impose any requirements upon the regulated community, local governments or the citizens of the planning region. By accepting this plan, including the recommendations explained above, the Governing Board is making a preliminary determination to pursue the courses of action set forth in the recommendations. Governing Board determinations are necessary prior to application of any one of the recommendations to affected citizens. Each recommendation is accompanied with a set of implementing steps; this demonstrates continued Governing Board involvement, review, decisions and participation in such areas as budget preparation, rulemaking and local government coordination. Moreover, these recommendations are not intended to be inflexible. For example, while acceptance of this plan will result in staff exploring the concepts stated in the recommendations, further analysis, input from interested citizens and other factors may influence the staff and/or Governing Board to alter the course set forth in this planning document. In sum, the recommendations are not self-executing and do not constitute final agency action on any of the subjects discussed. Meaningful points of entry will be provided prior to implementation of any recommendation which substantially affects the interests of any party.

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